Some Experience of CAP for MHEW in China

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- **Some progress of MHEW in China**
- **Some applications of CAP for MHEW**
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Background

- 2008 WenChuan **Mag. 8** earthquake
- Near **70,000** people died
- The government and the People in China want seconds of

early warning time to **Avoid the tragedy !**

About Institute of Care-life, China

Institute of Care-life, China(ICL)

Founded after the Wenchuan earthquake in 2008, starting from earthquake early warning to multi-hazard early warning

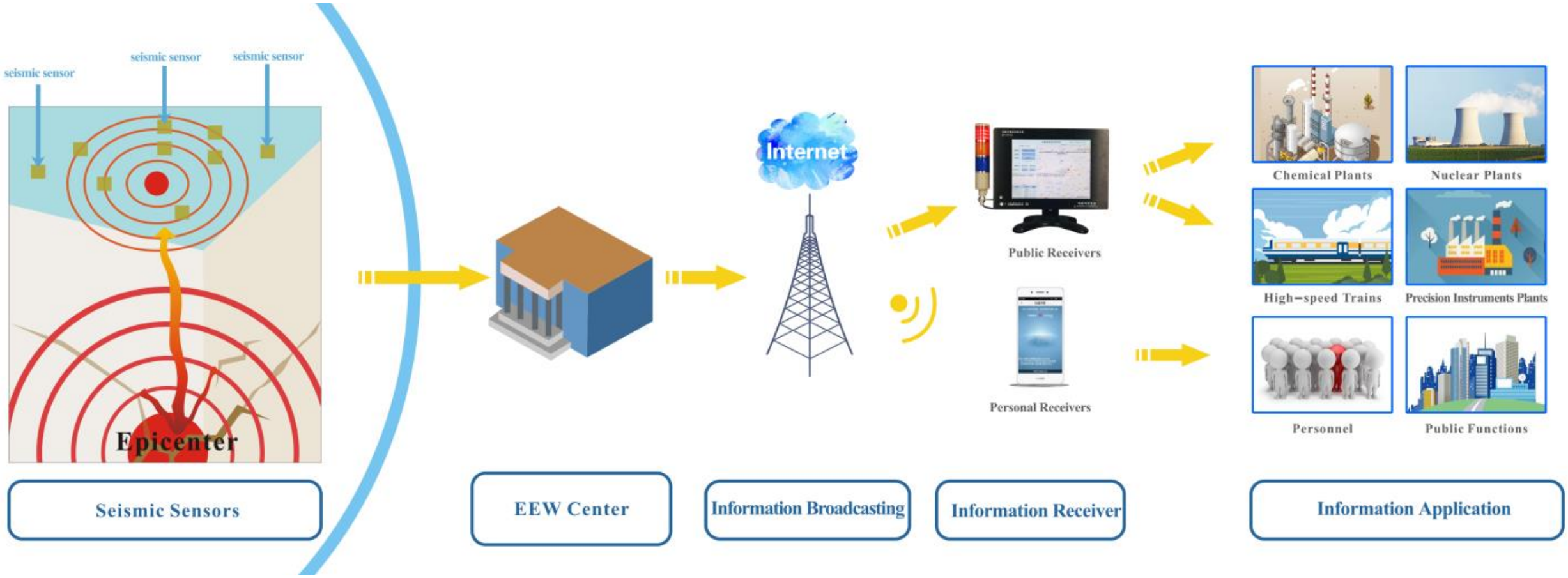
ICL MHEW tech. has given alerts to natural disasters for over 100 times

including 57 destructive earthquakes, over 50 landslides, mudslides, ground settlements, torrential floods and wildfires.

Setting up transmitting channels for warning messages through Tvs, mobile phones, special receivers for hundred millions of users

EEWS： 1、Sensors 2、EW Center 3、Receiver

sensors → Analyze → Transmission → Receive → Application



Earthquake Early Warning System supported by ICL

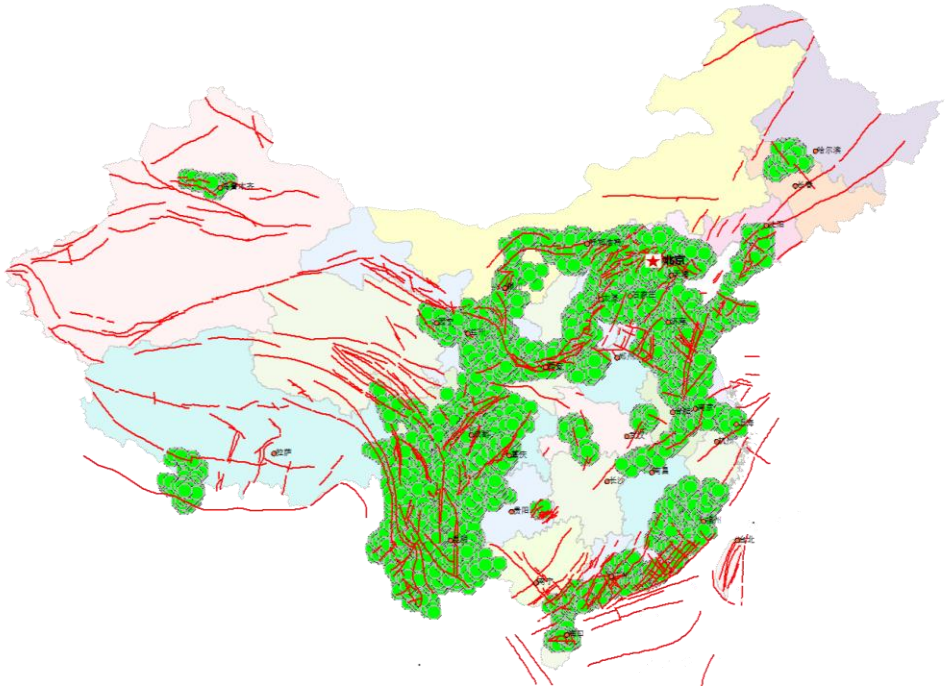
Since 2011, it has served the society safely, a typical case of Collaborative innovation among governments, research institutes and enterprises.

7000+
Monitor station

2.2 million km²
Area coverage

90%
The population of earthquake region

57 times
Destructive earthquakes



The area covered by ICL EEW sensors

ICL has built the world's biggest earthquake early warning network

EEW for 57 destructive quakes

Average Response Time = 6.2 seconds

No false and miss alert since 2011,
and for the 57 destructive quakes

Multi-hazard early warning system- technology system

Based on 20 three-dimensional data sources of “Sky-Air-Ground-Underground”

Sky

- Geosynchronous remote sensing satellite
- InSar Satellite

Air

- Network of meteorological data
- Thermodynamic diagram of population
- Drones system
- Airborne LiDAR
- Aerial photoing

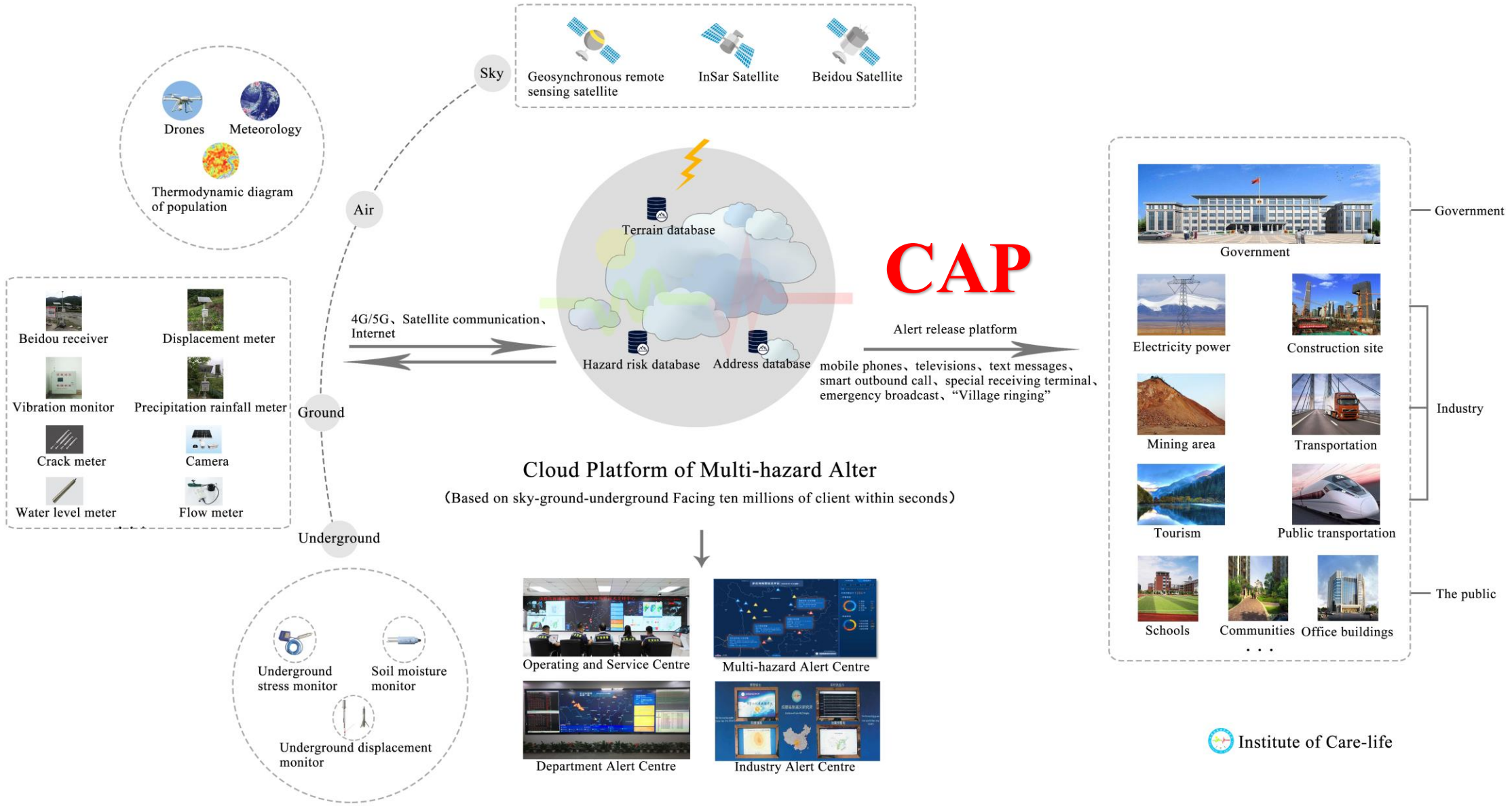
Ground

- Quick report on earthquake and intensity
- Landslide displacement monitor
- Visible light camera
- Surface inclinometre
- Rainfall precipitation monitor
- Mud level monitor
- Water level monitor
- IR Camera
- Digital terrain map
- disconnect instrument

Underground

- Underground displacement
- Underground stress monitor
- Soil moisture monitor
- Soil infiltration
- Geological disaster risks

Multi-hazard early warning technology system



Video introduction for ICL

Video to be added in here

Cooperations with various Chinese Institutes

ICL is committed to the R&D of multi-hazard early warning technology and releasing the alerts within seconds.

ICL and the Institute of Mechanics of the Chinese Academy of Sciences, in 2019, signed an agreement to jointly conduct preparatory work for the establishment of the National Key lab of multi-hazard early warning

ICL and National Early Warning Centre of China, in 2019, signed an agreement to jointly promote the precise services of multi-hazard early warning

International collaborations

Dr. Wang has been invited to the UN conference on multi-hazard early warning and delivered a speech as the only representative of China in 2019, he updated the progress on multi-hazard early warning system in China.

ICL continue to cooperate with parterners from home and abroad on hazard early warning.

3 countries are using ICL EEW tech.

China, Nepal, Indonesia are using ICL's EEW

In August 2015,China helped Nepal
to build earthquake early warning system

The Director of BMKG, Dwikorita Karnawati:
Grateful and applausive

The Counselor of the Chinese Embassy in Indonesia:
China is willing to actively participate in the construction of earthquake alert system in Indonesia, promote the cooperation and deliver the results to people in China and Indeonesia

In August 2019,China helped Indonesia
to build earthquake early warning system

Cooperation with famous enterprises in China

Setting up the “last mile” to Multi-hazard Early Warning

ICL cooperate with famous technological enterprises in China including Baidu, Xiaomi, vivo, Sogou, TCL and OPPO to break through the channel for transmitting the hazard early warning information to **hundred millions** of the users **within seconds** and promote the service and technology of hazard early warning

Cloud Platform of Multi-hazard Early Warning

The support center of the early warning technology of ICL 24/7 monitors satellites, meteorological data streams, monitoring networks of various physical quantity, system servers, cloud servers, early warning generating servers, early warning publishing servers, early warning centers, early warning sub-centers, and early warning receiving devices for key facilities to ensure the system is functioning well.

Provide technical support for early warning centres and sub- early warning centres at all levels

Governmental and industrial early warning centers

ICL supports governmental and industrial Early Warning Centers for their applications

The alert Sub-center for power industry

The early warning information release platform with full coverage, and a second-level response to hundreds of millions of users by region or industry

Based on CAP, the platform releases the alerts according to the types and levels of disasters to the public and facilities via TVs, mobile phones, “Loud Speaker”, special terminals and AI outbound call.

This platform serves hundreds of millions of users

Earthquake Early Warning

EEW APP

EEW broadcast

TV of EEW

Successful cases of landslides early warning

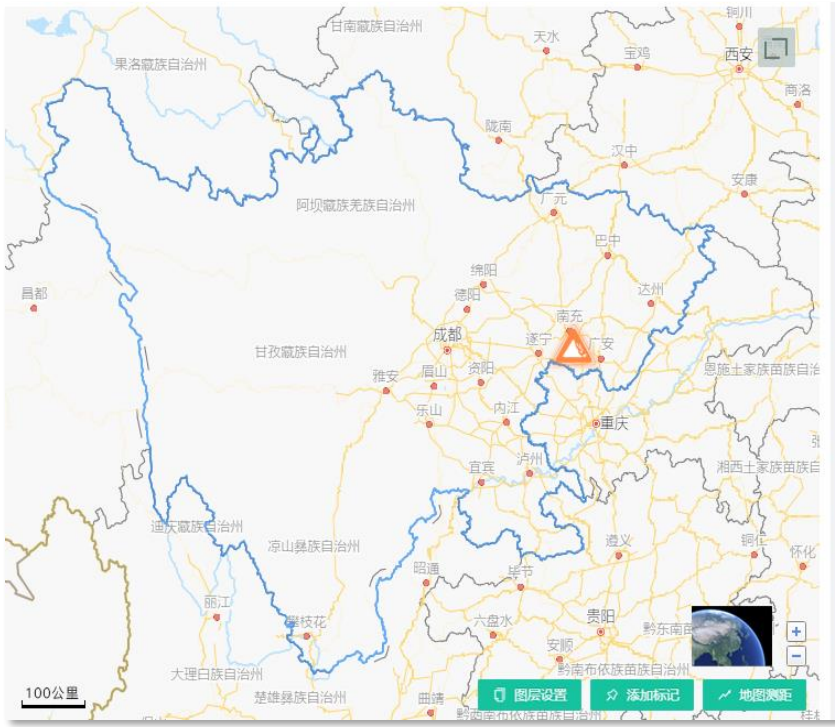
An landslide occurred in the 7th community of Huofeng Village, Xuejia Town, Gaoping District, Nanchong at 18:00 on July 16, 2020

Alter information：

The first orange alert was released at 17:46, July 15.

Update to red alert at 6:16 on July 16.

The alert was sent successfully **24hrs in advance**



Successful cases of mudslides early warning

Affected by heavy rainfall, a mudslide occurred in Duo Lajiao Gully, the first group of Dadi Village, Dapo Mongolian Township, Yanyuan County with a disaster scale of 3000m³, causing damage to 2 residential houses and 4 livestock pens at about 4:40 on July 8, 2020.

Alter information

The first blue alert was released at 19:35 on July 7

Update to red alert at 20:11 on July 7

The alert was successfully sent **9 hrs in advance.**

Successful cases of torrential floods early warning

On August 30, Qionglai, Chengdu suffered a heavy rain caused a torrential flood in Pingle Ancient Town

An orange alert was sent **80 minutes** in advance at 16:40 on August 30.

An red alert was sent **45 minutes** in advance at 17:15 on August 30.

Successful cases of wildfires early warning

The fire early warning function of the multi-hazard early warning system of Institute of Care-life was put into trial operation on April 16.

On April 20 and April 26 it has managed to monitor the wildfires occurred in Liangshan, Sichuan and Anzhou District, Mianyang, Sichuan

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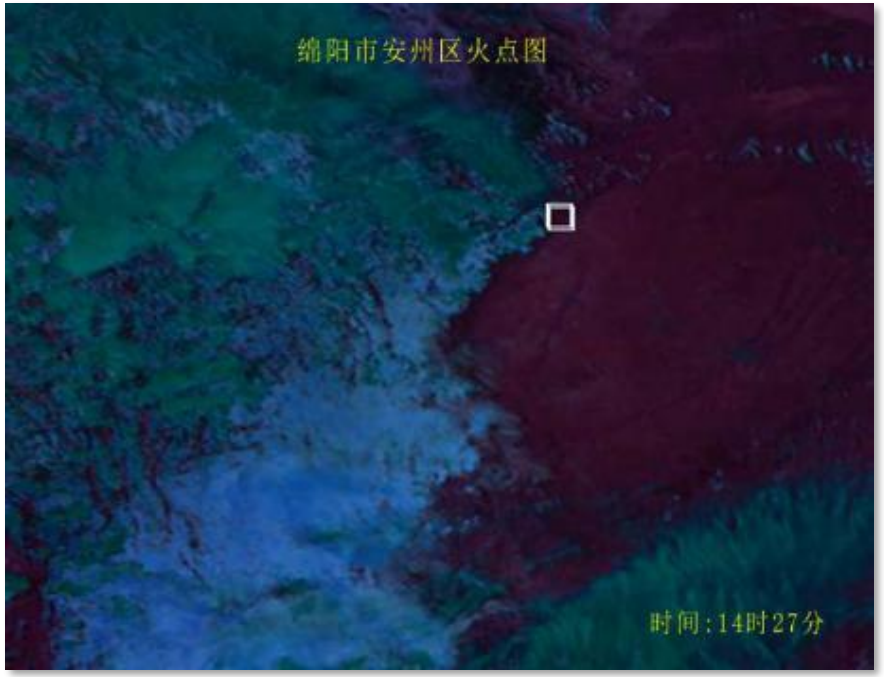
1小时连续5次告警 “四川智造”多灾种预警系统首次监测到山火火情

2020-04-21 09:05:00 来源：央广网

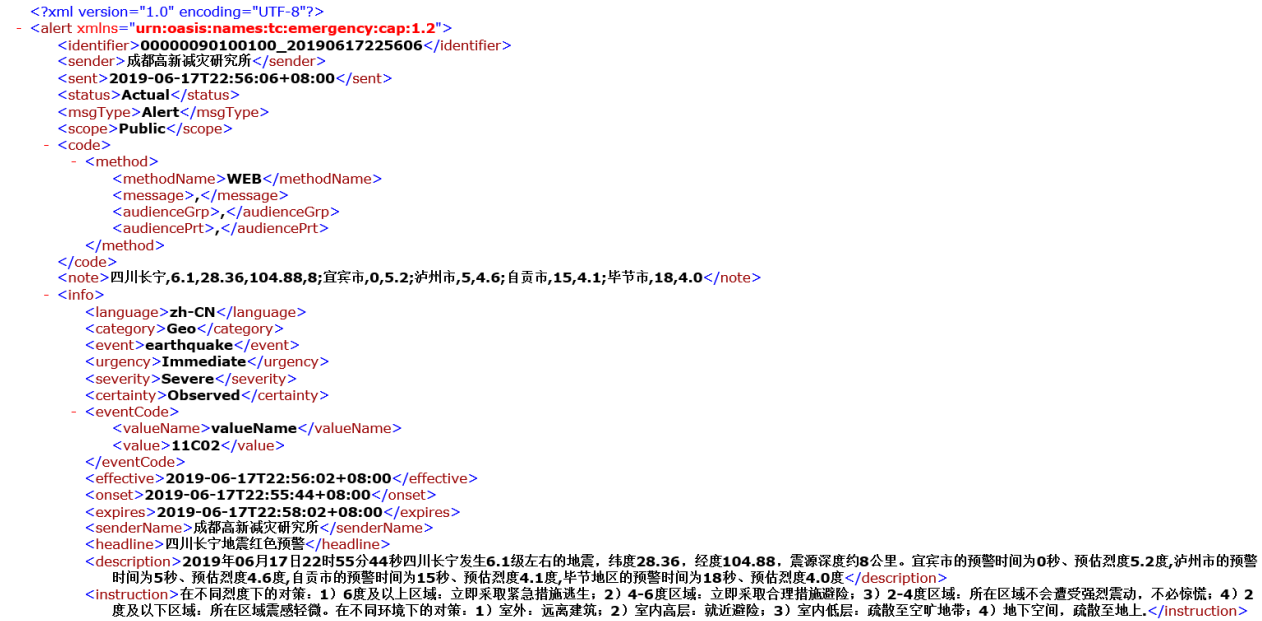
央广网成都4月21日消息（记者刘涛）据西昌市护林防火指挥部办公室消息，2020年4月20日14:20，西昌樟木箐镇李家沟村突发火情。目前正在全力组织扑救，起火原因待进一步调查。

当日下午14:49，成都高新减灾研究所灾害预警中心发出基于遥感卫星图像的火警，着火点位于四川省凉山彝族自治州西昌市。据统计，该系统1小时内针对该火情连续5次告警。成都高新减灾研究所(以下简称减灾所)已经将火情信息第一时间报送应急管理部门和凉山州相关部门，供决策参考。



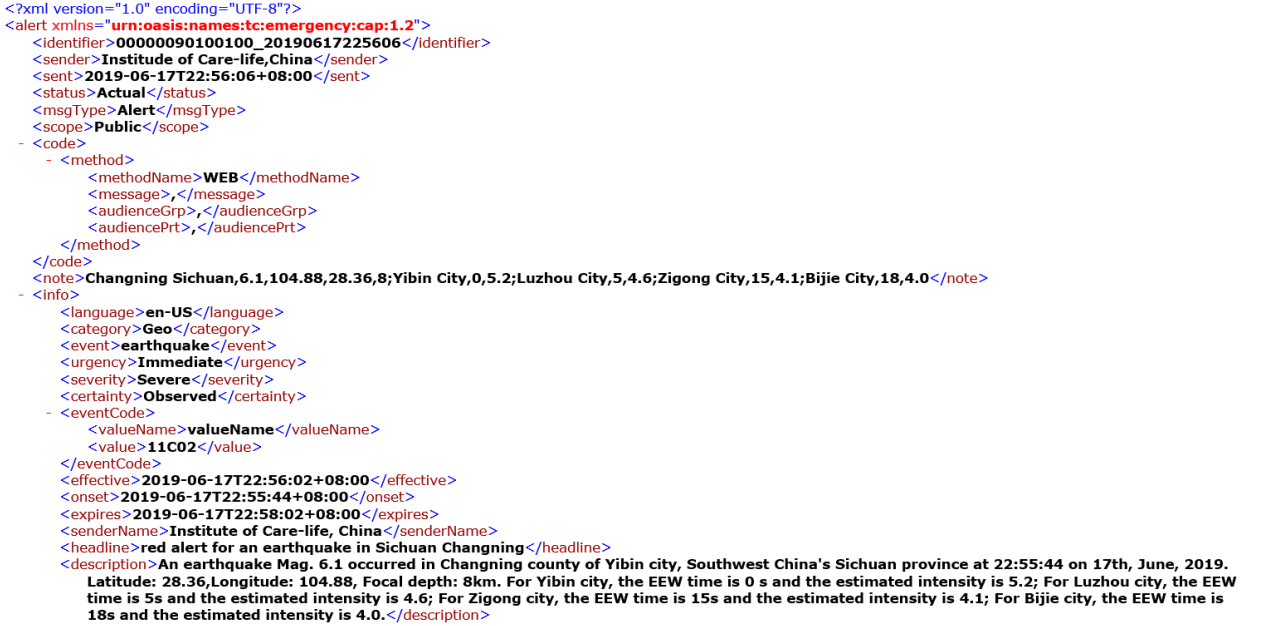
Applicable, convenient for all types of MHEW for natural disasters

Some applications of CAP for MHEW



```
<?xml version="1.0" encoding="UTF-8"?>
- <alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
    <identifier>00000090100100_20190617225606</identifier>
    <sender>成都高新减灾研究所</sender>
    <sent>2019-06-17T22:56:06+08:00</sent>
    <status>Actual</status>
    <msgType>Alert</msgType>
    <scope>Public</scope>
  - <code>
    - <method>
        <methodName>WEB</methodName>
        <message>,</message>
        <audienceGrp>,</audienceGrp>
        <audiencePrt>,</audiencePrt>
      </method>
    </code>
    <note>四川长宁,6.1,28.36,104.88,8;宜宾市,0,5.2;泸州市,5,4.6;自贡市,15,4.1;毕节市,18,4.0</note>
  - <info>
      <language>zh-CN</language>
      <category>Geo</category>
      <event>earthquake</event>
      <urgency>Immediate</urgency>
      <severity>Severe</severity>
      <certainty>Observed</certainty>
    - <eventCode>
        <valueName>valueName</valueName>
        <value>11C02</value>
      </eventCode>
      <effective>2019-06-17T22:56:02+08:00</effective>
      <onset>2019-06-17T22:55:44+08:00</onset>
      <expires>2019-06-17T22:58:02+08:00</expires>
      <senderName>成都高新减灾研究所</senderName>
      <headline>四川长宁地震红色预警</headline>
      <description>2019年06月17日22时55分44秒四川长宁发生6.1级左右的地震，纬度28.36，经度104.88，震源深度约8公里。宜宾市的预警时间为0秒、预估烈度5.2度,泸州市的预警时间为5秒、预估烈度4.6度,自贡市的预警时间为15秒、预估烈度4.1度,毕节地区的预警时间为18秒、预估烈度4.0度</description>
      <instruction>在不同烈度下的对策：1）6度及以上区域：立即采取紧急措施逃生；2）4-6度区域：立即采取合理措施避险；3）2-4度区域：所在区域不会遭受强烈震动，不必惊慌；4）2度及以下区域：所在区域震感轻微。在不同环境下的对策：1）室外：远离建筑；2）室内高层：就近避险；3）室内低层：疏散至空旷地带；4）地下空间，疏散至地上。</instruction>
```

CAP Earthquake Alert of ICL EEWS-CN



```
<?xml version="1.0" encoding="UTF-8"?>
- <alert xmlns="urn:oasis:names:tc:emergency:cap:1.2">
    <identifier>00000090100100_20190617225606</identifier>
    <sender>Institude of Care-life,China</sender>
    <sent>2019-06-17T22:56:06+08:00</sent>
    <status>Actual</status>
    <msgType>Alert</msgType>
    <scope>Public</scope>
  - <code>
    - <method>
        <methodName>WEB</methodName>
        <message>,</message>
        <audienceGrp>,</audienceGrp>
        <audiencePrt>,</audiencePrt>
      </method>
    </code>
    <note>Changning Sichuan,6.1,104.88,28.36,8;Yibin City,0,5.2;Luzhou City,5,4.6;Zigong City,15,4.1;Bijie City,18,4.0</note>
  - <info>
      <language>en-US</language>
      <category>Geo</category>
      <event>earthquake</event>
      <urgency>Immediate</urgency>
      <severity>Severe</severity>
      <certainty>Observed</certainty>
    - <eventCode>
        <valueName>valueName</valueName>
        <value>11C02</value>
      </eventCode>
      <effective>2019-06-17T22:56:02+08:00</effective>
      <onset>2019-06-17T22:55:44+08:00</onset>
      <expires>2019-06-17T22:58:02+08:00</expires>
      <senderName>Institute of Care-life, China</senderName>
      <headline>red alert for an earthquake in Sichuan Changning</headline>
      <description>An earthquake Mag. 6.1 occurred in Changning county of Yibin city, Southwest China's Sichuan province at 22:55:44 on 17th, June, 2019. Latitude: 28.36,Longitude: 104.88, Focal depth: 8km. For Yibin city, the EEW time is 0 s and the estimated intensity is 5.2; For Luzhou city, the EEW time is 5s and the estimated intensity is 4.6; For Zigong city, the EEW time is 15s and the estimated intensity is 4.1; For Bijie city, the EEW time is 18s and the estimated intensity is 4.0.</description>
```

CAP Earthquake Alert of ICL EEWS-EN

Some applications of CAP for MHEW

The EEW on 2019.01.03 Gongxian M5.3 earthquake

The EEW on 2017.08.08 Jiuzhaigou M7.0 earthquake

Suggestions for CAP

1. CAP need optimizations for applications with Location Based Service (LBS)

(1) a disaster has different impacts on different locations

(2) Cellphone with movable LBS service, and TVs with preset GPS locations can be used for calculating accurate alert levels

2. When serving hundreds of millions of users in seconds, to save network communication time, the CAP need to be more concise

e.g. In the event of a major earthquake, hundreds of millions of people need the urgent alert within 1~3 seconds to save lives

Suggestions for CAP

3. For cross country understanding of the MHEW alerts, the extension of CAP to standardize the sound, light, imagine pattern, etc. for alerts, is very necessary and important

4. Information transmission based on XML format is not efficient enough

We recommend to consider adopting a lightweight data exchange format, such as Json

Conclusion and outlook

- **ICL is willing to contribute to the optimization of CAP**

- **ICL is willing to contribute to the construction of a global MHEW system for a safer world**

Multi-hazard Early Warning System makes a safer world

CAP helps

Institute of Care-life, China